14 Jan 2014

Dear Sir/Madam,

Please find below an itemised response to each of the points raised by the second reviewer. (The first reviewer made no recommendations.)

Within the ‘action’ column, any additions to the manuscript text are highlighted **bold**.

Two revised copies of the manuscript are included:

“Manuscript – Revised – Tracked Changes”: In this version all tracked changes are highlighted. The comments feature has been used to indicate which change refers to which of the comments in the table below. (For example R6 indicates the change is made to comment 6 in the table below.)

“Manuscript – Revised – Tracked Changes accepted”: Showing the revised manuscript without tracked changes or comments.

I look forward to your response, and hope that the changes made meet with the requirements of the reviewer.

Kind regards,

Jon Minton

University of Glasgow

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| **Num** | **Comment Line** | **Comment Details** | **Response Comment** | **Action** |
| 1 | pg3ln28 | should make clear the only spatial characteristic that is really being tested here is country of birth/death |  | Changed the last sentence in paragraph:  “The purpose of this paper is to encourage the use of shaded contour plots by researchers interested in long-term trends in longevity, and how **this varies by country**. “ |
| 2 | - pg 3 ln 36 | - remove the comma following then |  | Done |
| 3 | pg 3 ln 37 | "Having done this" is superfluous |  | Done |
| 4 | pg 3 ln 46 | I would change "the other sources" to "some other sources" because this could be applied to a wide variety of data. |  | Done |
| 5 | Pg 3 ln 54-55 | there are some caveats to this data - for example what constitutes a live birth and a still birth is not universally agreed on in the present day, and has been greatly debated over the last few decades. These sorts of differences do make it harder to compare between nations. | I agree I should have included these caveats and have now revised the paragraph along these lines | New para reads:  Records of births and deaths have been collected by some states for hundreds of years. Although records of what happens to people between these events is more patchy, simply knowing these two facts about individuals can be very informative. **As with other variables, some variation in how births and deaths have been defined and recorded over time and between countries is inevitable. For example, the definitions of live births and still births are not universally agreed, and have varied over time. Despite this, records of births and deaths can be expected to be more consistent and comparable between time and place than almost any other variable.** Information about how old people are, though more uncertain, is inferable from previous records of births – subject to very little uncertainty – and previous and current records of inflows and outflows – subject to somewhat more uncertainty. Unlike life expectancies, which are based on projections, crude death rates – deaths divided by population size - are based on records of what has actually taken place. Both numerator and denominator are known with less uncertainty and for more of the population than most other variables. |
| 6 | Pg 4 ln 39 | I would add "in times of peace" after "Conversely" |  | Done |
| 7 | Pg 4 ln 39 | I think the mortality effect upon women that results from childbearing applies across the spectrum of female fertility (approximately from age 14-40) and is probably more heavily weighted at either end of this time span (although less pregnancies occur at the extremes). I'm not sure this fits the wording of "young". |  | The sentence now reads:  Conversely, **in times of peace**, adult females **– post menarche and pre menopause** - have always experienced additional mortality risks relative to age matched males due to childbirth. |
| 8 | - Pg 4 | general comment / aside - it would be very interesting if you could sub-divide your data by deprivation (even for one country) as this might show what impact deprivation has on the "scarring" effect of conflict. | I agree. I have added something along these lines to the discussion section. | The following two sentences have been added to the subsection: “Extending comparisons further over space and time”:  **We also expect that comparing the mortality surfaces of other subgroups within a nation, such as high and low socioeconomic deprivation subgroups, could be informative. For example, it may show differences in exposure to the mortality effects of war, changes in infant mortality, or changes in mortality risk at older ages.** |
| 9 | Pg 5 ln 7 | I would change "on the average" to "on average" |  | Done. |
| 10 | pg 5 ln 6-8 | this is very debatable - today most of those who see active service are much more likely to come from deprived backgrounds and I suspect this was the case in the wars captured in your data. This would have more of an impact on the mortality risk. | I agree. This could be argued either way. I have removed the example to avoid giving the impression this is what I expect. | Removed final sentence from paragraph beginning “The separation of civilian from total populations…” |
| 11 | Pg 5 ln 26 | should be "who have substantially" |  | Done |
| 12 | Pg 5 ln 27-8 | remove the comma and reword - current wording makes it sound as if the high morbidity rates are a result of the interest of demographers. | Agree this was ambiguous. Have reworded. | Paragraph now reads:  The New Zealand data are presented separately for the indigenous Maori population, who have substantially higher mortality and morbidity rates than the population at large**. Because of these differences, the Maori population have been of much interest to demographers and public health researchers.** |
| 13 | Pg 5 ln 38-57 | this is a very long paragraph to make a simple point - I'm not sure if this is necessary and it could be significantly reduced. This would make the paper more accessible and shift the focus to more important ideas. | I’ve trimmed this paragraph substantially. | The paragraph now reads:  There are a number of ways of presenting how a third variable, z, varies as a function of two others, x and y. One approach is simply to present the values of z as an array, x values along the row, y values along the column. Z values at each x-y configuration can be read off. There are two major disadvantages of this approach. Firstly, when there are many values to be presented, the data becomes unwieldy and hard to read. For example, in the case of the England and Wales datasets which were the primary object of discussion in the IJE article, there were over 13,000 values. Presenting each of these values becomes both cognitively and physically unwieldy. Secondly, though the method is intuitive to understand, its interpretation is not, and does not facilitate accurate at-a-glance comparison. Better, faster, more intuitive methods, which make it easier to see the wood for the trees, are needed. |
| 14 | Pg 6 ln 23 | it would be helpful to readers who are not familiar with the technique to offer a reference describing how to apply a 2 dimensional kernel filter. | I’ve added a reference and changed the last two sentences to make this clearer. | End of paragraph now reads:  Applying some form of spatial smoothing to these data, for example a two dimensional kernel density filter, may help to ameliorate this problem**. Kernel density filters smooth data by making the predicted value at a point dependent on weighted averages of nearby values, with nearer values weighted more strongly than more distant values. However, the output they produce is affected by the bandwidth parameter used by the filter, and so** what the visualisation looks like depend**s** partly on **how the filter has been applied.** |
| 15 | Pg 8 ln 25 | change describes to described |  | Done |
| 16 | Pg 8 lns 28-33 | very informal and not really consistent with scientific writing - these lines sound like a justification for not doing something you probably should do if the paper is to be accepted. I suggest you reword and reduce this substantially or remove. |  | Sentence deleted. |
| 17 | Pg 9 ln 5-9 | is it not possible to account for this and assign the same shade to equivalent values? Surely the whole point of these maps is to compare between populations in different geographies. | Additional sentences added to paragraph to make this clearer. | End of para now reads:  **It would be relatively straightforward, however, to produce additional contour maps in which a common shading scale is used for all visualisations. These may be more useful, for example, when comparing a large number of nations over the same period of time.** |
| 18 | Pg 9 ln 20-33 | presumably this refers to figure 5 - it might make it easier for the reader if you make this reference here. | This refers to the general concept but agree that fig 5 is a clear indication of this. | Have added reference to fig 5 here:  Age effects show how the mortality risk varies as people age. Historically, this relationship has been characterised as ‘bathtub shaped’: high in infancy, then low until early middle age, and then exponentially increasing in older age. (Gompertz 1825; Makeham 1860; Minton 2013a**; see also figure 5 of this paper**) |
| 19 | Pg 9 ln 40 | although they are relatively high, the same is also true for infant mortality rates in "developing" nations (ie rates are coming down rapidly) | I’ve revised the sentence slightly | Although in relative terms the first few years carry a much higher mortality risk than the years that follow, the size of this risk has reduced by some orders of magnitude over the course of the twentieth century **across the world.** |
| 20 | Pg 9 lns 45-6 | I am not sure the reference to the wars is relevant here as INFANT mortality was if anything lowered during the 2nd world war (an effect which has been partially attributed to rationing) | Have amended sentence slightly. | Sentence now reads:  Despite heavy involvement and **adult** losses in two world wars, the majority of this improvement **in infant mortality** occurred within around two generations, between 1900 and 1950. |
| 21 | Pg 9 lns 50-55 | this phraseology risks sounding patronizing as some of the nations which rapidly industrialized in the second half of the 20th century learned from the mistakes of the European nations as well... It also assumes that the driver of reduced infant mortality was entirely industrialization whereas there is a reasonable argument that the changes in wealth distribution and political enfranchisement that occurred in European nations and more latterly Japan had as much if not more influence on the health outcomes. Arguably the UK was industrial between 1850 and 1900 yet the gains in infant mortality were relatively modest in this period. Mortality in the first 5 years of life and to a lesser extent infant mortality also experienced the greatest gains in the 50 years before antibiotics were readily available, suggesting that this effect can't be attributed to modern industrialized medicine. | I’ve amended the sentence slightly. | Sentence now reads:  In addition to the large number of European nations included in the HMD, the inclusion of more recently industrialised nations like Japan will help to identify whether other **non-European** nations have been able to make a transition to low child mortality in a shorter period. |
| 22 | Pg 10 lns 49-53 | it would have been interesting if you had projected these contours and shown how different the resulting "bath tub" plots would look from the cohort projections we currently u use for planning for future health needs. This would have significant implications for the Health and social care services for the future if there was a significant difference. | I agree fully. This is what the graphical abstract suggests researchers should investigate. | I have added the following last sentence to the paragraph beginning “The bathtub curve for a contemporary cohort..”  **Differences in projections can have significant implications for, for example, the provision of health and social care services.** |
| 23 | Pg 11 ln 16 | I presume this is a typo and you meant 0.005? Also it would help readers of the paper if there was some way you could emphasize this contour in the graphic | Thanks for identifying the typo. | Typo corrected. I have added a link to a blog entry where a single contour line is emphasised in this way.  Sentences now read:  In these figures, the effect can be seen by looking at the contour line marked 0.0**0**5. **(See Minton 2013a for an example of a contour map where a similar contour line has been highlighted.)** |
| 24 | Pg 11 ln 17-22 | using the example of this contour in the non-log graph is actually a bit confusing - really the point at which this line suddenly becomes vertical rather than horizontal probably shows a threshold has been crossed in which the mortality risk for young men has rapidly reduced (only to return in the 2nd world war). If you had smaller contour values they would presumably still show a gradient. It is probably more helpful to the reader to refer to the Ukraine log figures first and then go back to the Norwegian ones to show how this sudden transition can be misinterpreted. | I agree that the effect is clearer on the log scale. However, I want to transition from identity to log representations in this part of the discussion, rather than the other way around, in order to avoid introducing too many new elements (new thing to look for and new way of visualising) at once. For this reason I hope it’s acceptable that I am keeping the figures in the same order. Instead I have changed the text to make it clearer why the log scale is preferable, and how the identity scale could mislead. | Two paragraphs changed. They now read:  The coming-of-age effect **is evident in some of the visualisations which stretch back over long periods of time**. For example, the effect is apparent when looking at the contour map of mortality rates for both males (Figure 7) and females (Figure 8) in Norway. In these figures, the effect can be seen by looking at the contour line marked 0.0**0**5. **(See Minton 2013a for an example of a contour map where a similar contour line has been highlighted.)** From the earliest records in the middle of the nineteenth century until about 1920, this line moves left to right rather than up to down, and divides old children, about fifteen years old, from young adults, about nineteen or twenty years old. Around 1930, this contour line moves upwards almost vertically upwards, meaning the risk receded into late adulthood. The coming-of-age effect indicates that people were exposed to a much increased mortality risk once they were culturally deemed to have ‘become men’ or ‘become women’, or equivalently that they were protected from these risks until they came of age.  **Although it may appear, when looking at the mortality surfaces, that the** coming-of-age effect has disappeared in Norway**, this is not the case.** Instead, as mortality rates which occur between infancy and old age have reduced so much, **absolute mortality rates are so low throughout much of the lifecourse that they appear indistinguishable on the standard mortality plots. Instead, the effect of entering adulthood on mortality is easiest to see by plotting the mortality surface on the logarithmic rather than identity scale.** |
| 25 | Pg 11 lns 51-7 | while this is very neatly displayed in your graphics this effect is not new, and has been well recognized as the leading causes of death in late childhood (mostly infection which has been largely eliminated by improving antibiotics) transition into causes of death in young people (suicide and road/industrial accidents, and war deaths, to which males are disproportionately at risk, and childbirth for women, a risk that is generally reducing) |  | Have added the following sentence to the end of the paragraph.  The values are positive for almost all age-year combinations plotted, meaning that males appear to have persistently higher mortality rates than females. The disparity becomes greatest from around the 1950s onwards, with a difference in log mortality rates of more than one. This male log mortality excess stretches from early adulthood, at around the age of 18 years, and continues into people’s twenties. **Although this effect is already known they are very easy to see using shaded contour plots.** |
| 26 | Pg 13 ln 14-15 | or famine? | Agree. Have made this addition. | Sentence now reads:  It may be that these period effects related to infectious diseases rather than conflict **or famine.** |
| 27 | Pg 13 ln 33 | - please address the numbering of the bullets -  we have already had a 1.1 | Thank you for identifying this. | Header numbering now addressed and corrected. |
| 28 | Pg 15 ln44 | - change "had" to "has". |  | Typo corrected. |
| 29 | Pg 15 lns 44-47 | - I'm not sure you can really say you have explored the effects of space and place on longevity - the spatial unit of analysis is whole countries and while some of the efects displayed are interesting it is hard to attribute them to spatial phenomena, when so many other phenomena effect populations of whole countries (for example, their political systems). | I agree that identifying the specific factors responsible for differences between populations is difficult/impossible given only national level data. However I think country level data can say some important things about differences in both space and place. I have amended the conclusion to qualify what I mean by place and space in this context. | Conclusion paragraph now split in two. First paragraph now reads:  This paper **has** illustrated a number of ways that shaded cohort maps can help researchers understand the influence that gender and nation have on long-term trends in longevity. It has identified a number of patterns both within and between nations. **We consider a shared national identity to be a coarse and crude, but easily accessible, indicator of variations in both space and place. It provides an indication of variation in spatial factors, such as the geography, geometry and climate experienced by populations. It also provides some indication variation in place, relating to factors such as culture, language, system of laws, socioeconomic infrastructure, and so on. Where possible, ‘natural experiments’, such as the disunion of Germany after the Second World War, which led to different members of the same population experiencing different political systems for over two generations, should be investigated in order to help tease out the influence of specific variables.** |
| 30 | Pg 15 ln 52 | - change "model" to "models" |  | Typo corrected |